

Problem 1-8



This type of reaction can be used to treat chlorinated organics prior to disposal. It is known generically as "hydrodechlorination". The HCl can be absorbed or adsorbed, and the C_2H_6 and unreacted H_2 can be burned.

$$\frac{r_{\text{C}_2\text{H}_3\text{Cl}_3}}{V_{\text{C}_2\text{H}_3\text{Cl}_3}} = \frac{r_{\text{H}_2}}{V_{\text{H}_2}} = \frac{r_{\text{C}_2\text{H}_6}}{V_{\text{C}_2\text{H}_6}} = \frac{r_{\text{HCl}}}{V_{\text{HCl}}}$$

a)
$$\frac{r_{\text{HCl}}}{V_{\text{HCl}}} = \frac{r_{\text{C}_2\text{H}_3\text{Cl}_3}}{V_{\text{C}_2\text{H}_3\text{Cl}_3}} \Rightarrow -r_{\text{C}_2\text{H}_3\text{Cl}_3} = \left(\frac{+1}{3}\right) r_{\text{HCl}}$$

Below the V_{HCl} term is a circled $+3$.
Below the $V_{\text{C}_2\text{H}_3\text{Cl}_3}$ term is a circled -1 .
An arrow points from the circled $+1$ in the stoichiometric coefficient to the r_{HCl} term.
The value $25 \times 10^{-6} \frac{\text{moles}}{\text{g.cat.-min}}$ is circled and has an arrow pointing to the r_{HCl} term.

$$-r_{\text{C}_2\text{H}_3\text{Cl}_3} = 8.33 \times 10^{-6} \frac{\text{moles C}_2\text{H}_3\text{Cl}_3}{\text{g.cat.-min}}$$

b)
$$\frac{r_{\text{C}_2\text{H}_6}}{V_{\text{C}_2\text{H}_6}} = \frac{r_{\text{HCl}}}{V_{\text{HCl}}} \Rightarrow r_{\text{C}_2\text{H}_6} = 8.33 \times 10^{-6} \frac{\text{moles C}_2\text{H}_6}{\text{g.cat.-min}}$$

Below the $V_{\text{C}_2\text{H}_6}$ term is a circled $+1$.
Below the V_{HCl} term is a circled $+3$.